Dr. Kraatz also mentions that "besides the build of the thorax *Linotarsia* is distinguished from *Stenotarsia* by the 3- (not 2-) toothed anterior tibiæ."

S. discoidalis and *S. picta* have three acute teeth in both sexes; but in *S. Scottii* (and *S. plagiata* more recently described by myself) the anterior tibiæ are only two-toothed in the male, the would-be basal one being so obscure as to be scarcely noticeable. In *S. punctiventris* here described, the anterior tibiæ have no trace of a third tooth, although the specimen is a female; I therefore place it in the genus *Stenotarsia*, although the form of the thorax &c. is that of "*Linotarsia Scottii*."

XLIV.—*On a Polythalamian from the Salt-pools near Déva in Transylvania.* By Dr. Eugen von Daday *.

The Protozoa of the numerous salt-ponds and pools in Transylvania were first studied, and compared with the Protozoan fauna of the sea and of fresh waters, by Prof. Géza Entz. It was found that "the Infusorian fauna of Transylvanian salt-pools, which cannot well be styled rich in comparison with that of the fresh waters, (1) possesses some new forms which have hitherto been found neither in fresh nor in sea water; (2) a portion of the Infusoria of the salt-pools has not previously been found in freshwater, but only in the sea; (3) the greater part of the Infusoria of the salt-pools is formed by those forms which occur both in fresh water and in the sea; and (4) only about a fourth part of the Infusoria found consists of forms which have not hitherto been found in sea-water"†. Lastly, however, it is stated that the Infusorian fauna of the continental salt-pools stands in closer relation to that of the sea than to that of the fresh water‡.

Among the thirty-seven Infusoria (Ciliata) enumerated in two memoirs§ by the above-mentioned naturalist from the salt-pools of Torda and Szamosfalva, eight species (*Acineta tuberosa*, Ehr.; *Phacus striatus*, Cohn; *Lacrymaria lagenula*, Clap. & Lachm.; *Aspidisca polystyla*, Stein; *Styloplotes*

* Translated by W. S. Dallas, F.L.S., from the 'Zeitschrift für wissenschaftliche Zoologie,' Band xl. pp. 465–480. (See a preliminary note in 'Annals,' vol. xiii. p. 307.)

† 'The Infusorian Fauna of the Salt-pools of Torda and Szamosfalva' (in Hungarian), 1876, pp. 9, 10.

‡ *Loc. cit.* p. 10.

§ "On some Infusoria of the Salt-pool at Szamosfalva" (in Hungarian), Naturhistorische Hefte, Bd. ii. pp. 219–258, Taf. viii., x.; (in German), *ibid.* Bd. iii. pp. 33–72.

appendiculatus, Stein ; *Uronychia transfuga*, Stein ; *Euplotes Harpa*, Stein ; *Oxytricha gibba*, Duj.) are exclusively marine forms ; fourteen species (*Loxophyllum lamella*, Ehr. ; *Loxophyllum fasciola*, Ehr. ; *Amphileptus anaticula*, Ehr. ; *Cyclidium glaucoma*, Ehr. ; *Pleuronema chrysalis*, Ehr. ; *Condylostoma patens*, Duj. ; *Chilodon cucullulus*, Ehr. ; *Aspidisca lynceus*, Ehr. ; *Aspidisca turrita*, Ehr. ; *Euplotes charon*, Ehr. ; *Stylonychia pustulata*, Ehr. ; *Metopus sigmoides*, Clap. & Lachm. ; *Vaginicola crystallina*, Ehr. ; *Cothurnia imberbis*, Ehr.) occur both in fresh waters and in the sea ; two genera (*Chanostoma margaritiferum* and *Sparotricha vexillifer*), three species (*Holophrya gulo*, *Chlamydodon cyclops*, and *Ervilia salina*), and four varieties (*Cothurnia imberbis*, var. *curvula*, *Vaginicola crystallina*, var. *annulata*, *Vorticella microstoma*, var. *halophila*, and *Vorticella nebulifera*, var. *salina*) are new ; and the Infusoria which have hitherto been known only out of fresh waters are represented only by six species (*Enchelys nebulosa*, Ehr. ; *Cyrtostomum leucas*, Stein ; *Cinetochilum margaritaceum*, Ehr. ; *Glaucoma scintillans*, Ehr. ; *Halteria grandinella*, Ehr. ; and *Stichotricha Mülleri*, Lachm.).

Of Rhizopoda the following were found in the salt-pool of Szamosfalva :—*Pleurophrys helix*, Entz ; *Plectophrys prolifera*, Entz ; *Euglypha pusilla*, Entz ; *Microcometes tristripetus*, Entz ; *Orbulinella smaragdea*, Entz ; *Ciliophrys infusionum*, Cienk. ; *Amœba guttula*, Duj. ; *Amœba limax*, Duj. ; *Amœba princeps*, Ehr. ; *Amœba diffluens*, Ehr. ; *Amœba radiosa*, Ehr. ; and *Podostoma filigerum*, Clap. & Lachm.* The general character of the Rhizopod-fauna of the salt-pool may be summed up as follows :—"On the whole, the salt-pool is poor in Rhizopod-forms ; those forms occur in greatest number which, while they are very common in fresh water, are probably to be reckoned in the series of those organisms which occur both in fresh and in sea water ; among the comparatively numerous forms peculiar to the salt-pool the specific allies of two (*Euglypha pusilla* and *Microcometes tristripetus*) have hitherto been found only in fresh water, while the nearest relative of another species (*Pleurophrys Helix*) lives in sea water ; of two new genera (*Plectophrys* and *Orbulinella*) one (*Orbulinella*) is allied to the marine Foraminifera with perforated shells ; and, finally, it may be noted as a negative character, that the *Arcellæ*, so numerous in fresh waters, and which are so easy to find that one can see them with the naked eye, as well as the *Difflugiæ*, which are equally abun-

* "Ueber die Rhizopoden des Salzteiches zu Szamosfalva," Naturh. Hefte, Bd. i. Heft 6, Taf. ix., x. (in Hungarian), pp. 185–199 (in German).

dant in fresh waters, are entirely wanting in the salt-pool as in the sea*.

The following pages are intended to furnish a further contribution to the knowledge of the Rhizopoda of the saline inland waters, and further to establish the proposition *that the Protozoan fauna of these waters presents remarkable agreements with the marine fauna.*

Having been occupied for some years with the study of the Crustacea of Transylvania, I made collections in August of last year in the salt-pools near Déva (in the south-western angle of Transylvania). On examining the results of my collections preserved in alcohol, I found, to my great astonishment, among the Copepoda, a great number of empty shells of a Polythalamian, which at once engrossed all my attention. In order to convince myself that the empty shells were derived from a still living Polythalamian, I repeatedly had sent to me in the course of this summer water from the above-mentioned salt-pools, and in this the shells constantly occurred, among the filaments of Algæ, in the mud, and floating at the surface. Unfortunately the shells were generally empty, only a few of them containing the protoplasmic body in some chambers, and I was unable to observe the interesting Polythalamian (probably the first representative of the whole order not living in the sea) in a state of vital activity.

According to the literature on living and fossil Polythalamia accessible to me, the Polythalamian of the salt-pools at Déva represents a new genus, which I shall name *Entzia*, in honour of my esteemed teacher.

The characters of the genus may be summarized as follows:—

The many-chambered chitinous shell is not perforated and contains imbedded siliceous lamellæ in great abundance. The spirally arranged chambers together form a shell wound from right to left, like the shell of a flat *Helix*. The chambers are entirely visible only from the convex side; on the concave side they cover one another, so that on the apical surface all the chambers are visible, but on the basal surface only those of the last whorl. On the outer partition of the last chamber there are two large, oval, tubularly produced apertures and two smaller circular ones, and these are repeated upon all the septa.

Species:—*Entzia tetrastomella*, with the characters of the genus.

* Naturh. Hefte, Bd. i. Heft 4, p. 199.

Morphology and Chemical Composition of the Shell.

The form of the shell, as already remarked, may be compared to that of the shell of a flat *Helix*, the whorls of which are coiled from left to right. In this respect our Polythalamian agrees with the genus *Rotalia*, belonging to the family Globigerinæ, Carp.; but while in the *Rotaliæ*, as Max Schultze remarks, specimens coiled to right and left are equally abundant*, I found the direction of the whorls in all specimens constantly from left to right. Consequently *Entzia* belongs to that series of forms in which the chambers, according to Max Schultze, are arranged in a spiral—that is, the group Helicostegia, d'Orb.

The apical surface is always convex, that is to say, the first chamber is placed higher and the following ones gradually descend, so that the last chamber comes to be the lowest. The natural consequence of this arrangement is that the basal surface of the shell is somewhat concave, and therefore that a dorsal and a ventral surface may be distinguished, upon the former of which the whorls and chambers may all be clearly distinguished, while on the latter only the chambers of the last whorl are visible. The dorsal and ventral surfaces show themselves most distinctly when the shell is looked at from the edge; and in this respect our Polythalamian resembles the Rotalinæ and *Rosalina ornata*, d'Orb.

In fully developed specimens the chambers always form two complete whorls, and in each whorl there are eight chambers, according to which I am probably justified in setting the number of chambers of the developed specimens at sixteen. And this I may do the more positively because among the numerous specimens which I have passed in review I have not met with a single one with more, but very many with fewer, than sixteen chambers. Thus I have found specimens with 6, 10, 12, 13, and 14 chambers. The latter scarcely admit of any other interpretation than that they are to be regarded as young individuals in various stages of development, which would have subsequently become developed into individuals with sixteen chambers. The correctness of this notion seems to be decisively proved by the fact that the corresponding chambers of the individuals with 6, 10, 12, 13, 14, and 16 chambers are of almost exactly the same form and size.

The outer margin of the shell and of both whorls, as in the Rotalinæ, is slightly waved and sinuous, in consequence of the convexity of the individual chambers; in other respects the surface is quite smooth.

* 'Ueber den Organismus der Polythalamien,' p. 59.

The results of the measurement of ten individuals are brought together in the following Table:—

Measured shell No.	Number of chambers.	Greatest diameter of the shell in millim.	Transverse diameter of the first chamber of the second whorl.	Transverse diameter of the primordial chamber.	Transverse diameter of the last chamber.
1	16	0·34	0·08	0·04	0·16
2	16	0·42	0·08	0·04	0·18
3	16	0·34	0·03	0·04	0·16
4	14	0·28	0·03	0·04	0·11
5	14	0·28	0·03	0·04	0·11
6	13	0·24	0 08	0·04	0·102
7	13	0·22	0·08	0·04	0·1
8	12	0·2	0·03	0·04	0·08
9	10	0·18	0·03	0·04	0·08
10	6	0·08	0·03	0·04	0·03

From this Table it appears that the largest of the 16-chambered individuals measures 0·42 millim., and that the size of the shell gradually decreases in accordance with the diminution in the number of the chambers, so that the smallest 6-chambered shell measures only 0·08 millim. Further I may note that the transverse diameter of the first chamber of the second whorl in all the measured shells has the same length of 0·08 millim., and that the diameter of the primordial chamber measures 0·04 millim. in all the shells. The greatest variation naturally occurs in the transverse diameter of the last chamber; but in individuals with an equal number of chambers this is also equal, only one 16-chambered shell forming an exception, in which the last chamber possesses a length of 0·18 millim., measuring, of course, from the inner margin of the whorl to the outer wall of the chamber.

However, I did not make measurements only of the primordial and last chambers, but also of the other chambers, and from these it appeared that the corresponding chambers in all individuals possess nearly the same size, the variations being so minute as hardly to deserve mention.

The numbers furnished by the measurements, I think, are in favour of the assumption, which is *à priori* correct, that the 6-, 10-, 12-, 13-, and 14-chambered individuals can only belong to the developmental series of the 16-chambered specimens, and I do not hesitate in the least to express this opinion.

As regards the form of the chambers I may sum up as

follows the results of my observations. The outline of the primordial chamber is always circular; this chamber appears to be perfectly round, at least its outer free surface decidedly represents a segment of a sphere. The second chamber is somewhat elongated; its anterior extremity (*i. e.* the one which is in contact with the primordial chamber) is conically pointed, while the posterior end is enlarged. All the following chambers form truncated triangles, of which the base is convex, while of the sides the one is curved inwards, the other outwards. Variations of form are frequent but insignificant. On the whole it may be said of the form of the chambers that it remarkably agrees with that of the chambers of *Rotalia veneta*, M. Sch., *Rotalia Freyeri*, M. Sch., and *Rosalina ornata*, d'Orb. (see Max Schultze, 'Ueber den Organismus der Polythalamien,' Taf. iii. figs. 1, 2, 4, 6, and 8).

The septa of the individual chambers are very characteristic of the genus, and agree in structure in all the chambers except the primordial one. The septum of the primordial chamber is not particularly developed, and only forms the corresponding completion of the rest of the wall of this chamber. The structure of the septum of all the other chambers is shown most distinctly by the anterior wall, that is to say, the operculum of the last chamber, when the shell standing on its edge is looked at from in front. We then see that the septum consists of two symmetrical halves, which meet together in the middle line like a roof, and to a certain extent seem to be independent portions of the shell. The whole septum is more or less convex—a condition which appears most distinctly in transverse sections.

My investigations led me to the conviction that the septa of the chambers, as in the Rotalinæ, are formed by two lamellæ, one belonging to the anterior, the other to the posterior chamber; but that in one species these lamellæ enclose no interseptal space, the boundary between the two lamellæ being indicated only by a sharp line. The rather thick septa thus formed are not perforated with fine pores any more than the other parts of the shell; but instead of these, two small round apertures and two larger oval ones are present, and these both morphologically and physiologically represent the fine orifices of the Rotalinæ and the other Polythalamia in general. By these four apertures the chambers are placed in communication with each other and the last chamber with the outer world.

The two smaller round apertures and two larger oval ones in the septa are extremely characteristic of our Polythalamian. Their position can be most certainly ascertained when the

shell placed upon its edge is examined in front. In this position of the shell it is at once seen that the two smaller round apertures are situated close to the middle line of the septum in the neighbourhood of the outer half, while larger oval apertures are placed beneath the small ones. As in sectional views the corresponding apertures cover each other, when the shell is looked at from the side only two apertures, one smaller and one larger, are ever to be seen.

The edges of both kinds of apertures are prominent and drawn out tubularly, an important character which of course appears most distinctly when examined from the side; in this position of the shell we see upon each septum a more prominent tube, narrowing from the base, and a shorter one, the longer of which originates from the larger and the shorter from the smaller aperture, the anterior free extremity of each being marked by an annular thickening. In this respect *Entzia tetrastomella* approaches the Lagenidæ, the septal orifices of which, according to Bütschli, are produced into tubes *, but it differs from these in the form and number of the apertures.

I now pass to the finer structure and chemical composition of the shell, and may remark here that in this respect *Entzia* appears to be one of the most interesting Polythalamia.

The colour of the shell varies from lighter or darker yellowish to deep brown, but generally shows those brownish tints which so frequently occur in chitinous structures. The substance of the shell contains angular plates of various sizes and forms, placed close together and entirely imbedded in the foundation-substance, so that, notwithstanding their presence, the shell retains a smooth surface. On this account I regard it as probable that the angular plates are not foreign bodies deposited from without in the substance of the shell, but that they are secreted from the protoplasm and deposited in the shell-substance, and that therefore they never project beyond the surface of the shell. Consequently I adhere to the opinion of Max Schultze, Schneider, and Entz, according to which the siliceous plates of the *Difflugiæ* and *Pleurophryes*, as well as of *Polymorphina silicea*, M. Sch., are secreted from the protoplasm and incorporated with the substance of the shell.

The circumstance that the shell is not very brittle, but possesses a considerable amount of flexibility, as proved by variously bent and compressed empty shells, and, further, the great resemblance of the shell in composition, as also in

* Bronn's 'Klassen und Ordnungen des Thierreichs,' 2te Aufl. Bd. i. p. 197.

colour, to the shells of *Difflugia* and *Pleurophrys*, led me from the first to suppose that it consists of a chitinous foundation-substance, in which the little angular plates are imbedded. The application of reagents in part confirmed the correctness of this supposition. First of all concentrated hydrochloric acid was employed, and this caused no change, any more than solutions of potash and soda. The colour, form, and structure remained unaltered. These results prove in the first place that the angular plates do not consist of carbonate of lime, but of silica, like the exactly similar plates of the *Difflugiæ*, *Pleurophryes*, and *Polymorphina silicea*, M. Sch.; and in the second place that the foundation-substance does not consist of horny material, but most probably of chitine. Concentrated sulphuric acid was then employed. The shells, after lying for a long time in sulphuric acid heated to boiling, lost their density and became very thin and flexible; they did not, however, entirely dissolve, but the septa separated, so that the shell broke up into its individual chambers. From these results I think I am justified in asserting that the foundation-substance of the shell consists of a chitinous compound, which, however, is partially displaced by deposition of silica, and remains pure only in the septa, as is proved by the breaking up of the shell into separate chambers on the application of sulphuric acid.

The results just communicated I think sufficiently prove the correctness of the above-stated proposition, that even in the chemical structure of its shell *Entzia* is one of the most interesting of Polythalamia, inasmuch as it combines those peculiarities which separately characterize the chitinous and sandy-shelled Rhizopoda. Further, I may also state that in this respect it comes nearer to the *Difflugiæ*, *Pleurophryes*, and sandy-shelled marine Mono- and Polythalamia than to the Rotalinæ, with which the form of its many-chambered shell ranges it.

The Soft Body.

Of the soft body, the protoplasmic body, I can unfortunately say but little, as I could not observe the Polythalamian in full vital activity. I was unable to obtain specimens containing the protoplasmic body in an uninjured state, but I succeeded, by staining with carmine, at least in rendering the protoplasmic body distinctly visible in single chambers.

In a preparation of a twelve-chambered specimen the ninth chamber was quite filled with the stained granular protoplasm. In it an oval nucleus with two darker nucleoli was

distinctly visible. It is particularly to be noted that I also found the nucleus in the ninth chamber, and consequently in one of the middle chambers, of the fully developed 16-chambered specimen, which agrees with the observations made by F. E. Schulze upon *Polystomella striatopunctata*, as that naturalist found the nucleus of the 30-chambered specimens of the *Polystomella* between the tenth and twentieth chambers, and therefore also in the middle chambers. It may be that other chambers also contain nuclei, but of this I could not convince myself with certainty.

I was no more successful in ascertaining the structure of the pseudopodia. As the shell, except on the septa, contains no visible pores, the pseudopodia will probably radiate from the four apertures of the last chamber; but it is not quite impossible that they may break through the substance of the shell elsewhere, as is affirmed of *Pleurophrys helix* by Géza Entz, who says:—"From the posterior rounded part of the body pseudopodium-like processes often issue, which, as in other Rhizopoda, attach the soft body to the shell; but in other cases such processes perforate the shell, and project far as rigid filaments. I have frequently also met with the same remarkable phenomenon, *i. e.* the perforation of the shell by pseudopodia in the freshwater *P. sphærica*, in which the pseudopodia radiate, as in an *Actinophrys*, from the whole surface of the shell!" *

As regards the reproduction, I can only state that I frequently met with forms such as are regarded by Max Schultze as the youngest forms of *Polystomella striyilata* †, and which must have formed part of the developmental series of *Entzia*.

Position in the System.

In order to settle the systematic position of *Entzia*, I compared it with the known Polythalamia; but as all the original works were not within my reach, I depend upon Bütschli's work.

From the detailed description above given it is clear that, according to the general form of its shell and the arrangement of the chambers, *Entzia tetrastomella* most closely approaches the subfamily Rotalinæ, which Bütschli characterizes in the following words:—"Shell depressed, spirally coiled, so that on the apical surface all the chambers, on the basal only those of the last whorl, are visible" ‡. Max Schultze also

* 'Naturhistorische Hefte,' Bd. i. 4, pp. 190, 191.
† *Loc. cit.* Taf. v. fig. 16.
‡ *Loc. cit.* p. 206.

says :—" The calcareous shell so formed of spirally arranged chambers, that it externally resembles the shell of a *Helix* or *Turbo*. The chambers visible only upon one, usually convex, side of the shell, concealed on the other side, which is less convex, plane, or concave " *. In this subfamily it seems to approach the genus *Rotalia*, but still more the genus *Pulvinulina*, with which it might easily be confounded; but it is distinguished by the fact that its shell, as above indicated, contains no pores, while, according to Max Schultze and Bütschli, these are always present in the above-mentioned and, indeed, in almost all other representatives of the family Globigerinæ of Carpenter. From the character of *Polymorphina silicea* given by Max Schultze, in which it is stated that the shell is apparently always solid, without fine pores, I believe that, notwithstanding the different form of its shell, *Entzia* is also allied to that species, and, indeed, chiefly because the shells of both contain siliceous plates.

If we further take into consideration that the shell of *Entzia* is not perforated by any fine pores, we cannot avoid thinking that it may be related to the Imperforata. In this group the genus *Trochammina*, cited in an appendix by Bütschli, might be mentioned, as we are told of it :—" The genus *Trochammina*, on the other hand, included a great number of mono- and polythalamous forms, differing remarkably in their forms, and only held together by the minute structure of their shell-walls. These are composed of fine sand-grains, which are so intimately united that the outer surface of the shell always appears smooth, nay, sometimes as if polished " †. Notwithstanding this remarkable agreement in the structure of their shells between the two genera, I must assert that *Entzia* is more distantly related to the Imperforata than to the Perforata, and, indeed, mainly on account of the structure of the septa of the chambers. In the description of the septa it has been stated that they are formed of two lamellæ, one belonging to the older, the other to the younger chamber, while the septum of the Imperforata is formed by a simple lamella. Upon this point, indeed, I have no personal knowledge, but I may be allowed to appeal to Bütschli, who says :—" In most cases this septum is formed, in the manner described, of a single shell-lamella, namely the continuation of the wall of the older chamber, that portion of the new chamber which rests against the old one, obtaining no special new wall, but being merely completed by the wall of the preceding chamber. This is the condition of things at

* *Loc. cit.* p. 58. † *Loc. cit.* p. 196.

least throughout the polythalamous Imperforata and a great part of the simple Perforata. In the more highly developed forms of the latter division the septum, however, is strengthened by the wall of the new chamber taking part in its formation" *. In accordance with this *Entzia* cannot possibly be referred to the Imperforata, but it represents a form which, in consequence of the absence of pores and the structure of the septa, unites the two main groups, but nevertheless approaches more closely to the Perforata than to the Imperforata.

Let us now take into consideration the composition of the shell-walls and their apertures, and compare *Entzia* in this direction with the Perforata. In characterizing the Lagenidæ, Carp., Bütschli says, amongst other things:—"Aperture usually characteristic, somewhat tubularly produced" †, while of the group Globigerinæ, Carp., he remarks, "Aperture, in opposition to the Lagenidæ, usually fissure-like, and not tubularly produced" ‡. In accordance with this, our genus, by virtue of the structure of its septa, certainly very closely approaches the subfamily Rotalinæ in the group Globigerinæ, but is sharply distinguished by its tubularly produced aperture, whilst in this respect it approaches the Lagenidæ, from which again it is distinguished by its septa possessing not a single aperture, but four of them, and, indeed, two larger oval ones and two smaller round ones, a case which, so far as I know, is quite isolated.

As regards the constitution of the shell, we have already shown that in our Polythalamian it consists of a chitinous foundation-substance which is impregnated with silica; this foundation-substance further contains angular siliceous plates of various forms and sizes. A similar constitution of the shell is, indeed, known in many Mono- and Polythalamia; but the composition of chitine and silica reminds one vividly of the *Difflugiæ* and allied Rhizopoda generally of fresh water. In this respect, indeed, our Polythalamian certainly comes near *Polymorphina silicea*, of which Max Schultze says:—"The shell is of a yellowish colour, characterized by numerous very irregular depressions, which do not perforate it, and consists, at least for the most part, of silica" §; but the shell of *Polymorphina* also seems to contain some lime, as indicated by Max Schultze's statement, "The quantity of calcareous salts that may be present with the silica can only be very small," &c. But with all this it cannot be said that *Entzia*, as regards the substance and structure of its shell, is far removed from

* *Loc. cit.* p. 45.
† *Loc. cit.* p. 197.
‡ *Loc. cit.* p. 200.
§ *Loc. cit.* p. 61.

the Globigerinæ, as in characterizing this group Bütschli expressly remarks, "Mono- or polythalamous, chitinous, calcareous (hyaline), or sandy" *.

After all that has been said we may range *Entzia tetrastomella* with the sandy-shelled forms of the group Globigerinæ, and especially with the "arenaceous Rotalinæ" and the genus *Trochammina*, of which Bütschli remarks:—"This embraces polythalamous forms, rotaloid, trochoid, or nautiloid in their winding, which in their form in part so nearly approach the calcareous Rotalinæ &c. that we are much inclined to place them in the vicinity of the latter"†.

From these comparative remarks I think I shall not be mistaken in asserting that:—

1. *Entzia tetrastomella*, the only continental Polythalamian at present known, resembles, in the form of its shell, the Rotalinæ of the group Globigerinæ, Carp.
2. In the structure of its shell it agrees with the genus *Trochammina* among the imperforate Polythalamia.
3. The structure of its septa agrees with that of the perforate Polythalamia.
4. The structure of the orifices of its septa is that of the Lagenidæ, Carp.
5. The chemical composition of its shell resembles that of the *Difflugiæ* and also that of *Polymorphina silicea* and the genus *Trochammina*, and reminds us of the group of the Globigerinæ.

Finally I regard it as probable that *Entzia tetrastomella*, with some forms of the genus *Trochammina*, represents a group which unites the imperforate with the perforate Polythalamia; at the same time it forms a genus which, by the intermedium of the Rotalinæ and the genus *Trochammina*, closely unites the group of the Lagenidæ with that of the Globigerinæ.

In conclusion I will devote a few words to those Protozoa associated with which *Entzia* occurs in the salt-pools. I noticed the following species:—

1. *Amœba limax*, Duj.
2. *Pleurophrys helix*, Entz.
3. *Dactylosphæra polypodia*, M. Sch.
4. *Cyphoderia ampulla*, Ehr.
5. *Orbulinella smaragdea*, Entz.
6. *Euglena viridis*, Ehr.

* *Loc. cit.* p. 200.

† *Loc. cit.* p. 196.

7. *Peranema trichophora*, Duj.
8. *Amphidinium operculatum*, Clap. & Lachm.
9. *Glenodinium cinctum*, Ehr.
10. *Acineta tuberosa*, Ehr.
11. *Strombidium sulcatum*, Ehr.
12. *Glaucoma scintillans*, Ehr.
13. *Cyclidium glaucoma*, Ehr.
14. *Chilodon cucullulus*, Ehr.
15. *Lionotus grandis*, Entz.
16. —— *fasciola*, Ehr.
17. *Euplotes charon*, Ehr.
18. *Oxytricha gibba*, Duj.
19. *Sparotricha vexillifer*, Entz.
20. *Cothurnia imberbis*, Ehr., var. *curvula*.
21. *Vaginicola crystallina*, Ehr., var. *annulata*.
22. *Vorticella microstoma*, Ehr.
23. —— ——, Ehr., var. *halophila*.
24. —— *nebulifera*, Ehr., var. *salina*.

The species cited, which can hardly give a complete picture of the Protozoan fauna of the salt-pool at Déva, may be divided into four groups, according to their known habitats.

1. *Species which have hitherto been found only in fresh waters.*

Cyphoderia ampulla, Ehr.
Euglena viridis, Ehr.
Peranema trichophora, Duj.
Glenodinium cinctum, Ehr.
Strombidium sulcatum, Ehr.
Glaucoma scintillans, Ehr.
Lionotus fasciola, Ehr.
Vorticella microstoma, Ehr.

2. *Species which occur both in fresh and saline inland waters and in the sea.*

Amœba limax, Duj.
Dactylosphæra polypodia, M. Sch.
Cyclidium glaucoma, Ehr.
Chilodon cucullulus, Ehr.
Euplotes charon, Ehr.
Vorticella nebulifera, Ehr.
Cothurnia imberbis, Ehr.

3. *Species which occur in saline inland waters and in the sea.*

Amphidinium operculatum, Clap. & Lachm.
Acineta tuberosa, Ehr.
Oxytricha gibba, Duj.

4. *Forms which have hitherto been found only in saline inland waters.*

Pleurophrys helix, Entz.
Entzia tetrastomella, gen. et sp. nov.
Orbulinella smaragdea, Entz.
Spirotricha vexillifer, Entz.
Lionotus grandis, Entz.
Cothurnia imberbis, Ehr., var. *curvula*.
Vaginicola crystallina, Ehr., var. *annulata*.
Vorticella microstoma, Ehr., var. *halophila*.
—— *nebulifera*, Ehr., var. *salina*.

The representatives of the first two groups are all very common species, of which I have nothing to say. The cilioflagellate *Amphidinium operculatum*, Clap. and Lachm., included in the third group, is, on the contrary, a very interesting form, which merits some notice. This species was discovered by Claparède and Lachmann in the Norwegian fjords, but then for a long time was not again met with. It is again mentioned by Stein in his quite recent monograph of the Cilioflagellata (Arthrodelous Flagellata) of the Baltic; and Prof. Entz has shown me sketches of this Cilioflagellate which he made in Naples, and, according to an oral communication, he found the species abundantly in the Bay of Naples. According to these data *Amphidinium operculatum* is a marine species, which gives a decidedly marine character to the Protozoan fauna of the salt-pool near Déva. Of this interesting species I will further state that my investigations convinced me that the so-called circlet of cilia consists of a spirally twisted flagellum, which possesses an undulating frill, the oscillations of which simulate the supposed cilia; the same character, as I have since learned, has also been demonstrated by Klebs in *Hemidinium nasutum*, *Gymnodinium fuscum*, and *Peridinium habulatum*, so that it seems to me very probable that the Cilioflagellata throughout do not possess a circlet of cilia.

In the fourth group *Entzia tetrastomella* is naturally the most interesting form. It is the only known Polythalamian which has been met with except in the sea*, and, together with *Amphidinium operculatum*, it speaks decidedly in favour of the proposition laid down by Prof. Géza Entz, according to which the Protozoa of the saline inland waters are more nearly allied to those of the sea than to those of the fresh waters. The other Protozoa of this group are species which

* [But see H. B. Brady, "On Brackish-water Foraminifera," Ann. & Mag. Nat. Hist. ser. 4, vol. vi. 1870, pp. 273-309.—W. S. D.]

have previously been found only in the salt pools near Torda and Szamosfalva in Transylvania.

On the whole the Protozoan fauna of the salt-pool near Déva agrees pretty well with that of the pools at Torda and Szamosfalva, but in *Entzia tetrastomella* and *Amphidinium operculatum* it has to show two species peculiarly characteristic of this pool.

BIBLIOGRAPHICAL NOTICES.

Vergleichende Morphologie und Biologie der Pilze, Mycetozoen und Bacterien. Von A. de Bary. Engelmann: Leipzig, 1884.

It may be said at once that no more welcome contribution could have been made to botanical science at the present time than Prof. de Bary's new book. Eighteen years ago, when he published the 'Morphologie und Physiologie der Pilze, Flechten und Myxomyceten,' students of these organisms were presented with a treatise embracing the whole field of a subject where were lying scattered abundant materials sorely in need of critical selection and arrangement. Of Prof. de Bary's special qualifications for the task it would not become me to speak; it is sufficient that they enabled him to produce a book which may be said, without the smallest fear of contradiction, to have given an impulse to the study amounting to a new departure in its history. This sowing of fresh seed has again yielded so fruitful a crop in the hands of many active workers that a new edition of the text-book has for some years been greatly wanted. The present work supplies the want, and testimony of the extent of the advance that has been made appears in the fact that it is in reality a new book, resembling the former, perhaps, more in the thoroughness, vigour, and fertile thought displayed in its pages than in the special treatment of the matter. During the interval between the two books there arose such an accumulation of material to be dealt with, and entangled with it so many points of controversy to be discussed, that not only a fresh treatment of the matter became necessary, but a limitation in some measure of the scope of the treatise. The physiology of fungal organisms has received so much notice in the general physiological works of Sachs and Pfeffer, and in the vast literature that has grown up on the subject of fermentation, that Prof. de Bary has rightly considered it expedient to deal with it less fully in the circumstances. But, as we are reminded in the preface, morphological treatises of great extent can scarcely now (and certainly not in the present instance) be satisfactorily produced without constant reference to the phenomena which are specially termed biological—the modes and the adaptations of life; and in dealing with these one necessarily comes in contact with purely physiological matters.